

**JP10149760 A**  
**FIELD EMISSION TYPE COLD**  
**CATHODE APPARATUS,**  
**MANUFACTURE THEREOF, AND**  
**VACUUM MICROAPPARATUS**  
**TOSHIBA CORP**

**Abstract:**

**PROBLEM TO BE SOLVED:** To provide a field emission type cold cathode apparatus having an even field emission property and high field emission efficiency and capable of being driven at low voltage.

**SOLUTION:** This field emission type cold cathode apparatus comprises a supporting substrate 12 and a plurality of emitters 14 formed on the supporting substrate 12 to emit electrons. Each emitter 14 is constituted of a plurality of carbon tubes 16 basically made of strings of 6-member carbon rings. Not than 70% of the total carbon tube 16 has 30nm or smaller diameter. The aspect ratio, which is the ratio of the height to the bottom part diameter, of the carbon tubes 16 composing the emitters 14 is set to be not less than 3 and not higher than  $1 \times 10^6$ , preferably not less than 3 and not higher than  $1 \times 10^3$ . The cycle of the 3-member carbon rings of the carbon tubes 16 is 0.426nm or 0.738nm or integer times as long as these values.

[no drawing]

**Inventor(s):**

NAKAMOTO MASAYUKI

**Application No. 09249096 JP09249096 JP, Filed 19970912, A1 Published 19980602**